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EXAMINER	
CORBETT, JOHN M	

ART UNIT	PAPER NUMBER
2882	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/578,295	WU ET AL.	
	Examiner	Art Unit	
	JOHN M. CORBETT	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7 August 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

1. Claims 30-44 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

With respect to claim 30, the claim is drawn to a computer program. A computer programs per se are an abstract set of instructions. Therefore, a computer program is not a physical thing (product) nor a process as they are not "acts" being performed. As such, these claims are not directed to one of the statutory categories of the invention (See MPEP 2106.01), but directed to nonstatutory functional descriptive material.

It is noted that a computer readable medium or other structure embodied with a computer program, which would permit the functionality of the program to be realized, would be directed to a product and be within a statutory category of invention, so long as the computer readable medium is not disclosed as non-statutory matter per se (signals or carrier waves). Although claim 30 states that "the computer program code being embodied in a computer readable medium", the claim is directed to "A computer program …" where the computer readable medium is considered to be an intended use of the computer program. The claim must be directed to "A computer readable medium …". Claims 31-44 are rejected by virtue of their dependency.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 6-11 and 23-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Claus et al. (US 2004/0264636 A1).

With respect to claim 1, Claus et al. discloses a tomosynthesis method (Abstract) for creating a three-dimensional reconstruction (Paragraph 65) of a target element volume (114) comprising:

acquiring radiation absorbance images of the target element volume through a limited plurality of angles (Paragraphs 40 and 48 and Figure 5);

dividing the target element volume into a plurality of volume segments (Paragraphs 51 and 58 and Figure 7);

applying a reconstruction algorithm to each segment to generate a three-dimensional reconstruction of each volume segment (Paragraphs 51 and 58); and

merging the three-dimensional reconstruction of each volume segment to create a three-dimensional reconstruction of the target volume (Paragraph 65 and Figure 7).

With respect to claim 16, Claus et al. discloses a system (200) for three-dimensional tomosynthesis imaging (Title) of a target element (114) comprising:

an image acquisition element (Figures 3 and 5) for obtaining a plurality of images of the target element from a plurality of angles (Paragraphs 40 and 48 and Figure 5) having:

a radiation source (110) positionable at a plurality of positions with respect to the target element (Paragraph 40 and Figure 5); and

a radiation detector (216) positioned so as to detect radiation emitted by the radiation source passing through the target element (Figure 5) and determine a plurality of attenuation value for radiation passing through the target element to establish a radiation absorbance projection image of the target element for a particular radiation source position (Paragraph 45); and

a processor (218) configured to apply a reconstruction algorithm to the radiation absorbance projection images of the target element obtained from a plurality of radiation source angles to generate a three-dimensional reconstruction of the target element (Paragraphs 51 and 58) wherein the processor is further configured to divide the target volume into a plurality of image reconstruction volume segments for separate image reconstruction of the volume segments (Paragraphs 51 and 58 and Figure 7) and mergence of the reconstructed volume segments into a three-dimensional reconstruction of the target element (Paragraph 65 and Figure 7).

With respect to claims 6 and 23, Claus et al. further discloses the volume segments comprise volume segments having a complex shape that is dependent upon the acquisition

geometry and makes the reconstruction of each segment independent of the reconstruction of any other segment (Paragraph 58).

With respect to claims 7 and 25, Claus et al. further discloses the volume segments comprise volume segments having a slanted rectangular shape so that the reconstruction of each segment is independent of the reconstruction of any other segment (Paragraph 58 and Figure 7).

With respect to claim 8, Claus et al. further discloses the images are obtained using an image acquisition element (Figure 5) having:

a radiation source (110) positionable at a plurality of positions with respect to the target element (Paragraphs 40 and Figure 5); and

a radiation detector (216) positioned so as to detect radiation emitted by the radiation source passing through the target element (Figure 5) and determine a plurality of attenuation value for radiation passing through the target element to establish a radiation absorbance projection image of the target element for a particular radiation source position (Paragraph 45).

With respect to claims 9 and 24, Claus et al. further discloses the radiation source is positionable at a plurality of angles in a first plane (Figure 6).

With respect to claims 10 and 26, Claus et al. further discloses the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and spaced apart

from the first plane, each slanted rectangular volume segment extending from its base in a direction toward the radiation source (Paragraph 58 and Figure 7).

With respect to claims 11 and 27, Claus et al. further discloses the method is deployed in mammography (Paragraph 69).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 2-5 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. as applied to claims 1 and 16 above, and further in view of Guillemaud et al. (US 2005/0078862 A1).

With respect to claims 2 and 19, Claus et al. discloses the method and system as recited above.

Claus et al. fails to disclose segments overlap.

Guillemaud et al. teaches segments overlap (Paragraph 48).

It would have been obvious to one of ordinary skill at the time the invention was made to modify the method and system of Claus et al. to include the overlap of Guillemaud et al., since a

person would have been motivated to make such a modification to improve imaging by providing more information (Paragraph 48) as taught by Guillemaud et al.

With respect to claims 3 and 20, Claus et al. necessarily further discloses the volume segments overlap by an amount sufficient to result in a three-dimensional reconstruction of the target volume that does not differ substantially in quality from an (hypothetical) unsegmented reconstruction.

With respect to claims 4 and 21, Claus et al. necessarily further discloses the value of a majority of the pixels in the three-dimensional reconstruction of the target volume differ by less than about 1% from pixels in the (hypothetical) unsegmented reconstruction.

With respect to claims 5 and 22, Claus et al. necessarily further discloses the volume segments overlap by between about 0 and 50 percent (Segments from each of the two linear trajectories overlap so that overlap greater than 0 percent and is necessarily less than 50 percent since greater that 3 planes reconstructed for each linear trajectory as noted in figures 2A and 2B)..

4. Claims 12-13 and 280-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. as applied to claims 11 and 27 above, and further in view of Villafana ("AAPM Tutorial: Generators, X-ray Tubes, and Exposure Geometry in Mammography", 1990, Radiographics, Volume 10, Pages 539-554).

With respect to claims 12 and 28, Claus et al. discloses the method and system as recited above.

Claus et al. further discloses first plane (Figures 4 and 5).

Claus et al. fails to disclose substantially parallel to a patient's chest wall

Villafana teaches substantially parallel to a patient's chest wall (Figures 11- 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method and system of Claus et al. to include the parallel imaging of Villafana, since a person would have been motivated to make such a modification to improve imaging and patient health by collimated the beam parallel to the chest wall thereby maximizing the area of the breast that is imaged while minimizing exposure to tissue that is not imaged (Pages 546-548, Exposure Geometry) as taught by Villafana.

With respect to claims 13 and 29, Claus et al. further discloses volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and space apart from the patient's chest wall, each slanted rectangular volume segment extending from its base in a direction toward the radiation source (Paragraph 58 and Figure 7).

5. Claims 14-15 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. as applied to claims 1 and 16 above, and further in view of Bleut et al. ("An Adaptive Fan Volume Sampling Scheme for 3D Algebraic Reconstruction in Linear Tomosynthesis",

October 2002, Proceedings of the IEEE Nuclear Science Symposium and Medical Imaging Conference, Volume 49, Issue 5, Part 1, Pages 2366-2372).

With respect to claims 14 and 17, Claus et al. discloses the method and system as recited above.

Claus et al. fails to explicitly disclose the method is carried out using a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors.

Bleut et al. teaches the method is carried out using a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors (Pages 1721-1722, Section A. Geometrical Concept and Page 1724, Col. 1, lines 3-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method and system of Claus et al. to include the processors of Bleut et al., since a person would have been motivated to make such a modification to improve imaging by reducing computation time (Page 1723-1724, D. Computation times) as taught by Bleut et al.

With respect to claims 15 and 18, Claus et al. discloses the method and system as recited above.

Claus et al. fails to disclose each segment reconstruction is carried out using a different processor of the plurality of processors.

Bleut et al. further teaches each segment reconstruction does not depend on the other reconstructed planes allowing for direct parallelizing of the reconstruction processing (Page 1722, Col. 1, lines 5-7) and reconstructing on plural processors (Page 1723-1724, D. Computation times).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method and system of Claus et al. to include the parallelizing and the plural processors of Bleut et al., since a person would have been motivated to make such a modification to improve imaging by reducing computation time (Page 1723-1724, D. Computation times) as taught by Bleut et al.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method and system of Claus et al. as modified above each different processor for each, since discovering an optimum value of a result effective variable involves no more than routine skill in the art. One would have been motivated make such a modification to improve imaging by reducing computational times by processing ***independent*** reconstruction processes each on a different processor thereby maximizing the time savings when reconstructing (Page 1723-1724, D. Computation times) as implied by Bleut et al.

6. Claims 30 and 35-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. in view of Hsieh (6,529,575).

With respect to claim 30, Claus et al. discloses a configuration for three-dimensional tomosynthesis (Abstract and Paragraph 65) imaging of a target element volume (114) from a plurality of radiation absorbance projection images obtained from different positions from an image acquisition element having a radiation source (110) positionable at a plurality of positions (Paragraphs 40 and 48 and Figure 5) with respect to the target element and a radiation detector (216) positioned so as to detect radiation emitted by the radiation source passing through the target element volume (Figure 5) and determine a plurality of attenuation values for radiation passing through the target element to establish a radiation absorbance projection image of the target element volume for a particular radiation position (Paragraph 45), by performing the steps of

dividing the target element volume into a plurality of volume segments (Paragraphs 51 and 58 and Figure 7);

applying a reconstruction algorithm to each segment to generate a three-dimensional reconstruction of each volume segment (Paragraphs 51 and 58); and

merging the three-dimensional reconstruction of each volume segment to create a three-dimensional reconstruction of the target volume (Paragraph 65 and Figure 7).

Claus et al. fails to explicitly disclose a computer readable medium encoded with a computer program which when implemented on a computer causes the computer to perform steps.

Hsieh teaches a computer readable medium encoded with a computer program which when implemented on a computer causes the computer to perform steps (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the configuration of Claus et al. to include the computer readable medium of Hsieh, since person would have been motivated to make such a modification to improve imaging by more easily updating existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

With respect to claim 35, Claus et al. further discloses the volume segments comprise volume segments having a complex shape that is dependent upon the acquisition geometry and makes the reconstruction of each segment independent of the reconstruction of any other segment (Paragraph 58).

With respect to claim 36, Claus et al. further discloses the radiation source is positionable at a plurality of angles in a first plane (Figure 6).

With respect to claim 37, Claus et al. further discloses the volume segments comprise volume segments having a slanted rectangular shape so that the reconstruction of each segment is independent of the reconstruction of any other segment (Paragraph 58 and Figure 7).

With respect to claim 38, Claus et al. further discloses configured to use images obtained using an image acquisition element (Figure 5) having:

a radiation source (110) positionable at a plurality of angles in a first plane with respect to the target element (Paragraph 40 and Figure 5); and

a radiation detector (216) positioned so as to detect radiation emitted by the radiation source passing through the target element (Figure 5) and determine a plurality of attenuation value for radiation passing through the target element to establish a radiation absorbance projection image of the target element for a particular radiation source angle (Paragraph 45).

With respect to claim 39, Claus et al. further discloses the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and spaced apart from the first plane, each slanted rectangular volume segment extending from its base in a direction toward the radiation source (Paragraph 58 and Figure 7).

With respect to claim 40, Claus et al. further discloses configured to be deployed in mammography (Paragraph 69).

7. Claims 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. and Hsieh as applied to claim 30 above, and further in view of Guillemaud et al.

With respect to claim 31, Claus et al. as modified above suggests the configuration as recited above.

Claus et al. fails to disclose segments overlap.

Guillemaud et al. teaches segments overlap (Paragraph 48).

It would have been obvious to one of ordinary skill at the time the invention was made to include in the configuration of Claus et al. as modified above the overlap of Guillemaud et al., since a person would have been motivated to make such a modification to improve imaging by providing more information (Paragraph 48) as taught by Guillemaud et al.

With respect to claim 32, Claus et al. necessarily further discloses the volume segments overlap by an amount sufficient to result in a three-dimensional reconstruction of the target volume that does not differ substantially in quality from an (hypothetical) unsegmented reconstruction.

With respect to claim 33, Claus et al. necessarily further discloses the value of a majority of the pixels in the three-dimensional reconstruction of the target volume differ by less than about 1% from pixels in the (hypothetical) unsegmented reconstruction.

With respect to claim 34, Claus et al. necessarily further discloses the volume segments overlap by between about 0 and 50 percent (Segments from each of the two linear trajectories overlap so that overlap greater than 0 percent and is necessarily less than 50 percent since greater that 3 planes reconstructed for each linear trajectory as noted in figures 2A and 2B).

8. Claims 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. and Hsieh as applied to claim 40 above, and further in view of Villafana.

With respect to claim 41, Claus et al. discloses the configuration as recited above.

Claus et al. further discloses first plane (Figures 4 and 5).

Claus et al. fails to disclose substantially parallel to a patient's chest wall

Villafana teaches substantially parallel to a patient's chest wall (Figures 11- 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Claus et al. as modified above the parallel imaging of Villafana, since a person would have been motivated to make such a modification to improve imaging and patient health by collimated the beam parallel to the chest wall thereby maximizing the area of the breast that is imaged while minimizing exposure to tissue that is not imaged (Pages 546-548, Exposure Geometry) as taught by Villafana.

With respect to claim 42, Claus et al. further discloses volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and space apart from the patient's chest wall, each slanted rectangular volume segment extending from its base in a direction toward the radiation source (Paragraph 58 and Figure 7).

9. Claims 43-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claus et al. as applied to claim 30 above, and further in view of Bleut et al.

With respect to claim 43, Claus et al. as modified above suggests the configuration as recited above.

Claus et al. fails to explicitly disclose the steps are carried out using a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors.

Bleut et al. teaches the steps are carried out using a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors (Pages 1721-1722, Section A. Geometrical Concept and Page 1724, Col. 1, lines 3-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Claus et al. as modified above the processors of Bleut et al., since a person would have been motivated to make such a modification to improve imaging by reducing computation time (Page 1723-1724, D. Computation times) as taught by Bleut et al.

With respect to claim 44, Claus et al. as modified above suggests the configuration as recited above.

Claus et al. fails to disclose each segment reconstruction is carried out using a different processor of the plurality of processors.

Bleut et al. further teaches each segment reconstruction does not depend on the other reconstructed planes allowing for direct parallelizing of the reconstruction processing (Page

1722, Col. 1, lines 5-7) and reconstructing on plural processors (Page 1723-1724, D. Computation times).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Claus et al. as modified above the parallelizing and the plural processors of Bleut et al., since a person would have been motivated to make such a modification to improve imaging by reducing computation time (Page 1723-1724, D. Computation times) as taught by Bleut et al.

Bleut et al. fails to explicitly teach each reconstruction is carried out using a different processor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Claus et al. as modified above each different processor for each, since discovering an optimum value of a result effective variable involves no more than routine skill in the art. One would have been motivated make such a modification to improve imaging by reducing computational times by processing ***independent*** reconstruction processes each on a different processor thereby maximizing the time savings when reconstructing (Page 1723-1724, D. Computation times) as implied by Bleut et al.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Smith et al. ("Fan-Beam Reconstruction from a Straight Line of Source Points", 1993, IEEE Transactions on Medical Imaging, Volume 21, Number 1, Pages 10-18) discloses a straight line trajectory for imaging where the volume images can be segmented into a series of independent fan-beam reconstructions comprised of pixels which can be efficiently implemented on a parallel computer (Abstract, Page 10, Col. 2, line 8 – Page 11, Col. 1, line 14).

Magnusson Seger et al. ("Scanning of logs with linear cone-beam tomography", Available online 23 May 2003, Computers and Electronics in Agriculture, Volume 41, Pages 45-62) discloses performing linear cone-beam tomography (i.e., tomosynthesis) and reconstructing complex shaped or slanted rectangular shaped voxels (Abstract and Figures 4-6 and 9).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

/Edward J Glick/
Supervisory Patent Examiner, Art Unit 2882